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Kramer Electronics, Ltd.

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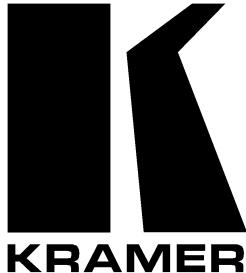
USER MANUAL

Model:

VS-88HC

8x8 Home Entertainment Matrix Switcher

Contents

Figures

Tables

1   Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite range of problems that confront the video, audio and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 500-plus different models now appear in 8 Groups[1], which are clearly defined by function.

Congratulations on purchasing your **VS-88HC** *8x8 Home Entertainment Matrix Switcher*, which is ideal for the following typical applications:

- Professional audio/video studios
- Home cinema DVD applications

The package includes the following items:

- **VS-88HC** *8x8 Home Entertainment Matrix Switcher*
- Power cord and Null-modem adapter
- Windows®-based Kramer control software[2]
- Windows®-based Ethernet Configuration Manager and Virtual Serial Port Manager
- Infra-red remote control transmitter (including the required battery and a separate user manual[3])
- This user manual[3]

2   Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high resolution cables[4]

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.

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1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Scalers; and GROUP 8: Cables and Connectors

2 Downloadable from our Web site at http://www.kramerelectronics.com

3 Download up-to-date Kramer user manuals from our Web site: http://www.kramerelectronics.com

4 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

Step 1: Mount the machine - see section 5

Mount the machine in a rack or
stick the 4 rubber feet to the underside
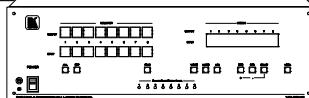
Step 2: Connect the inputs and outputs - see section 6

Connect the
video
and audio
inputs
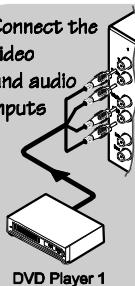
Connect the
video and audio
outputs
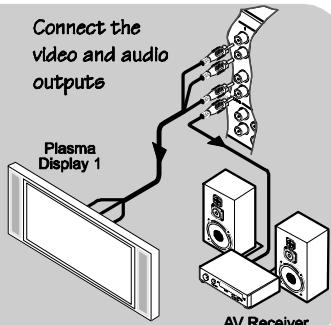
OPTIONAL:

Connect the
audio to the
optical input
and/or output

OPTICAL OPTICAL AUDIO ON CHAN. 2
IN
OUT

Plasma
Display 1
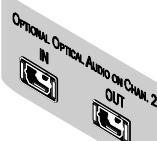
Connect to a
remote IR
Receiver unit

REMOTE
IR

DVD Player 1

AV Receiver

Step 3: Connect the control port - see section 7

If required, connect an RS-232 Control Port, an RS-485 port and/or the ETHERNET

Step 4: Turn the power ON

Step 5: Set the machine - see sections 7 and 8

SELECTOR

OUTPUT

INPUT   1   2   3   4   5   6   7   8

STATUS

OUTPUT   1   2   3   4   5   6   7   8

INPUT

Set/Address
RS-485 Term

1 2 3
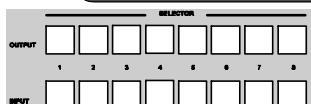
Use the SELECTOR buttons to switch the
inputs to the outputs
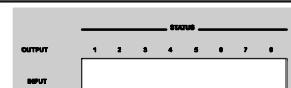
Read the STATUS on the 7-segment
display

Set the
dipswitches

ALL   OFF

TAKE

VIDEO   AUDIO   AFV

LOCK

STO   RCL   DELAY
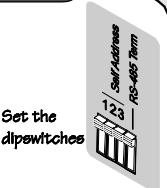
Connect a
selected input
to ALL the
outputs

Disconnect
an output

Press TAKE
to confirm
actions

VIDEO - Switching relates
to the video signal
AUDIO - Switching relates
to the audio signal
AFV -   Audio follows video
when switching

LOCK the
front panel
buttons

Store (STO) and recall
(RCL) actions
or set the audio DELAY
time

Step 6: Operate the machine

Operate via the front panel buttons, IR remote control, RS-485, RS-232, and ETHERNET

3   **Overview**

The Kramer **VS-88HC** is a matrix switcher designed for high quality home entertainment. It is a true 8x8 matrix switcher for HDTV compatible, component video (Y, Pb/Cb, Pr/Cr), digital audio (S/PDIF) and analog unbalanced stereo audio signals, letting you simultaneously route any of the eight inputs to any or all of the eight outputs. The component video, S/PDIF and analog audio signals are on RCA connectors. The S/PDIF INPUT/OUTPUT 2 is also available on optical (TOSlink) input/output connectors.

The **VS-88HC** features:

- A resolution of up to 1080p, fully loaded
- An audio channel sampling rate of up to 192kHz, including multi-channel audio (suitable for multi-channel applications, like AC3)
- A built-in digital audio delay line on OUTPUT 2, which corrects lip sync errors, so that the audio delay will match the video delay
- DC coupled video inputs and outputs
- Audio-follow-video and breakaway options, as well as input and output analog audio level control
- Storing and recalling of 16 setups
- A TAKE button for precise switch control
- A LOCK button to prevent tampering with the front panel
- A 7-segment display showing the status

Control the **VS-88HC** using the front panel buttons, or remotely via:

- RS-232 and RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- The Kramer infra-red remote control transmitter
- The ETHERNET
- An external remote IR Receiver (optional)

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **VS-88HC** away from moisture, excessive sunlight and dust

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3.1 Terminology Used in this User Manual

Table 1 defines some terms that are used in this user manual:

Table 1: Terminology Used in this User Manual

Term	Definition
802.3	The standard specification for ETHERNET that is maintained by the Institute of Electrical and Electronics Engineers (IEEE).
Dynamic Host Configuration Protocol (DHCP)	Allows the network administrator to distribute IP addresses from a central point and automatically send a new IP address when an Ethernet point is plugged into a different network location.
Gateway	A network position serving as an entry to another network. On the Internet, a node or stopping point can be either a gateway node or a host (end-point) node.
IP Address	A 32-binary digit number that identifies each sender or receiver (within a network via a particular server or workstation) of data (HTML pages or e-mails) that is sent in packets across the Internet. Every device connected to an IP network must have a unique IP address. This address is used to reference the specific unit.
Local Area Network (LAN)	Computers sharing a common communications line or wireless link, which often share a server within a defined geographic area.
Media Access Control (MAC) Address	A computer's unique hardware number (or address) in a LAN or other network. On an Ethernet LAN, the (MAC) address is identical to the Ethernet address.
Transmission Control Protocol/Internet Protocol (TCP/IP)	The basic communication language or protocol of the Internet that breaks the message into appropriately sized packets for the network, and can be used as a communications protocol in an intranet or an extranet.

4 Your VS-88HC 8x8 Home Entertainment Matrix Switcher

Figure 1 and Table 2 define the **VS-88HC** *8x8 Home Entertainment Matrix Switcher* front panel:
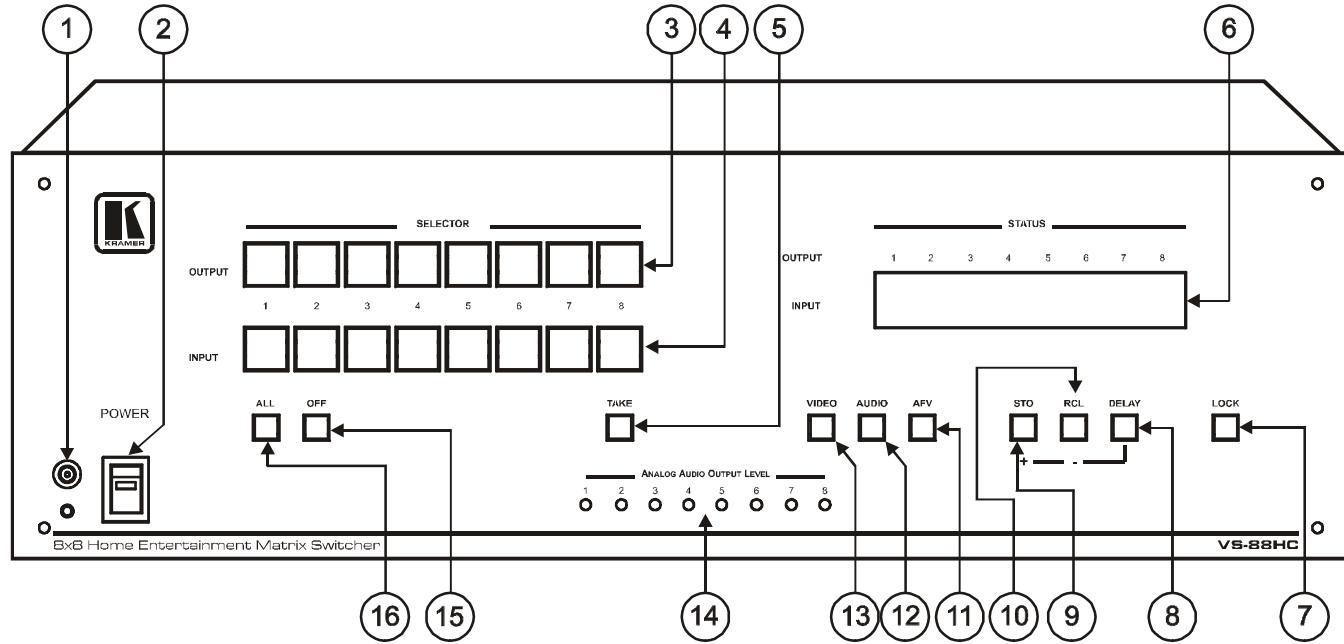
Figure 1: VS-88HC 8x8 Home Entertainment Matrix Switcher Front Panel

Table 2: Front Panel VS-88HC 8x8 Home Entertainment Matrix Switcher Features

#	Feature		Function
1	IR Receiver		The red LED is illuminated when receiving signals from the infra-red remote control transmitter
2	*POWER* Switch		Illuminated switch for turning the unit ON or OFF
3	*SELECTOR* Buttons[1]	*OUTPUT*	Select the output to which the input is switched (from 1 to 8)
4		*INPUT*	Select the input to switch to the output (from 1 to 8)
5	*TAKE* Button		Pressing TAKE toggles the mode between the Confirm mode[2] and the At Once mode (user confirmation per action is unnecessary). When the TAKE button flashes (in the confirm mode), pressing it implements pending actions
6	*STATUS* 7-segment Display		Displays the selected video INPUT switched to the OUTPUT (marked above each input)[3]
7	*LOCK* Button		Disengages/engages the front panel switches
8	*DELAY* Button		Press to toggle the output 2 DELAY feature between: On – activates the delay Set – sets the delay time and Off – turns off the delay (see section 8.6)
9	*STO /+* Button		Pressing STO, followed by an output button, stores the current setting[4]; when adjusting the audio delay, press to increase the delay time
10	*RCL /-* Button		Pressing the RCL button and the corresponding OUTPUT key recalls a setup from the non-volatile memory; when adjusting the audio delay, press to decrease the delay time
11	*AFV* Button		When illuminated[5], the subsequent actions relate to the video and audio channels. The audio channels follow the video channels. Press to toggle
12	*AUDIO* Button		When illuminated[6], the subsequent actions relate to audio. Press to toggle
13	*VIDEO* Button		When illuminated[6], the subsequent actions relate to video. Press to toggle
14	*ANALOG AUDIO OUTPUT LEVEL* Trimmers[7]		Turn to adjust the output signal levels (from 1 to 8)
15	*OFF* Button		An OFF-OUTPUT combination disconnects that output from the inputs; an OFF-ALL combination disconnects all the outputs
16	*ALL* Button		Pressing ALL followed by an INPUT button, connects that input to all outputs[8]

Figure 2 and Table 3 define the **VS-88HC** *8x8 Home Entertainment Matrix Switcher* rear panel:

---

1 The digital audio inputs are switched only to digital audio outputs and the analog audio inputs are switched only to analog audio outputs

2 When in the Confirm mode, the TAKE button flashes

3 Also displays the audio sample rate, the delay time and so on. Refer to section 8.1

4 For example, press STO and then the OUTPUT button # 3 to store in setup # 3

5 When in AFV mode

6 When in audio breakaway mode, either the AUDIO or the VIDEO button is illuminated and the AFV button is OFF

7 Insert a screwdriver into the hole and carefully rotate it, to trim the level

8 For example, press ALL and then input button # 2 to connect INPUT 2 to all the outputs
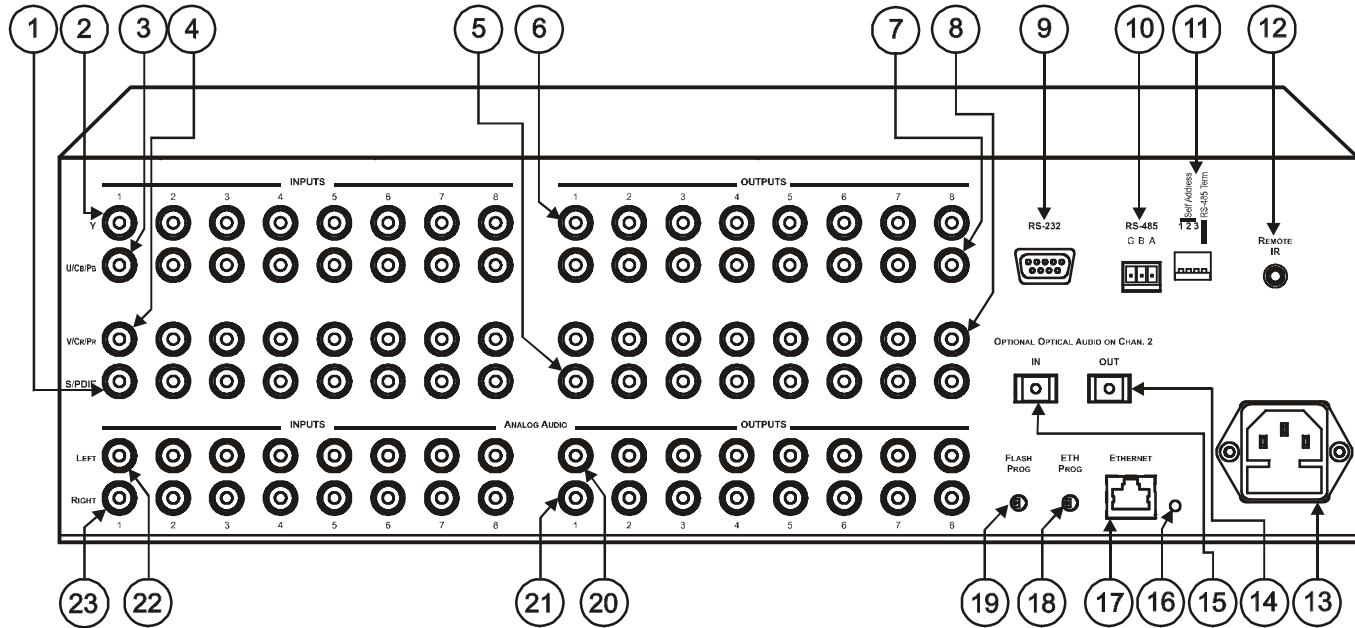
*Figure 2: VS-88HC 8x8 Home Entertainment Matrix Switcher Rear Panel*

Table 3: Rear Panel VS-88HC 8x8 Home Entertainment Matrix Switcher Features

#	Feature				Function
1	INPUTS		S/PDIF		Connect to the digital audio source (from INPUT 1 to 8)
2		Component	Y RCA Connectors		Connect to the component (Y, U/Cb/Pb, V/Cr/Pr) video source (from INPUT 1 to INPUT 8)
3			U/Cb/Pb RCA Connectors		
4			V/Cr/Pr RCA Connectors		
5	OUTPUTS		S/PDIF		Connect to the digital audio acceptor (from OUTPUT 1 to 8)
6		Component	Y RCA Connectors		Connect to the component (Y, U/Cb/Pb, V/Cr/Pr) video acceptor (from OUTPUT 1 to 8)
7			U/Cb/Pb RCA Connectors		
8			V/Cr/Pr RCA Connectors		
9	RS-232 DB 9F Port				Connect to the PC or the Remote Controller via a null-modem connection
10	RS-485 Terminal Block Port				Pins B (-) and A (+) are for RS-485; Pin G may be connected to the shield (if required)
11	Setup Dipswitches				Dipswitches for setup of the unit (1, 2 and 3 are for setting the Self Address #; and 4 is for RS 485 termination)
12	REMOTE IR 3.5mm Mini Jack				Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[1]
13	Power Connector with Fuse				AC connector enabling power supply to the unit
14	OPTIONAL OPTICAL AUDIO ON CHAN. 2 TOSLINK Connector			OUT	Connect to the digital audio acceptor
15				IN	Connect to the digital audio source
16	ETH Factory Reset Button				Press to reset to factory default definitions[2]: IP number – 192.168.1.39 Mask – 255.255.255.0 Gateway – 192.168.1.1
17	ETHERNET Connector				Connects to the PC or other Serial Controller through computer networking LAN
18	ETH PROG Button				Push in to upgrade ETH firmware (see section 9.2); release for normal operation
19	FLASH PROG Button				Push in[3] for "Program" to upgrade the switcher microcontroller to the latest Kramer firmware (see section 9.1.2), or release (the factory default) for normal operation
20	ANALOG AUDIO	OUTPUTS	LEFT		Connect to the left audio acceptor (from OUTPUT 1 to 8)
21			RIGHT		Connect to the right audio acceptor (from OUTPUT 1 to 8)
22		INPUTS	LEFT		Connect to the left audio source
23			RIGHT		Connect to the right audio source

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1 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the VS-88HC (only if the internal IR connection cable has been installed)

2 First disconnect the power cord and then connect it again while pressing the ETH Factory Reset button. The unit will power up and load its memory with the factory default definitions

3 Using a screwdriver if required

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The **VS-88HC** underside is defined in Figure 3 and Table 4:
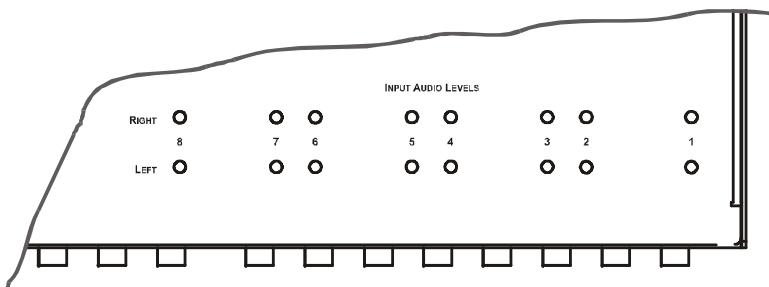
Figure 3: VS-88HC Underside View

Table 4: VS-88HC 8x8 Underside Features

Feature	Function
INPUT AUDIO LEVELS Trimmers	Turn to adjust the RIGHT and/or the LEFT input signal levels (from 1 to 8)[1]

4.1 Using the IR Transmitter

You can use the **RC-IR2** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[2]. The external IR receiver can be located 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables[3].

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert an internal IR connection cable[4], which is required so that the REMOTE IR 3.5mm connector can be used. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

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1 Insert a screwdriver into the hole and carefully rotate it, to trim the level

2 P/N: 95-0104050

3 P/N: 95-0103050

4 P/N: 505-70434010-S

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5   Installing the VS-88HC on a Rack

This section describes what to do before installing on a rack and how to rack mount.

Before Installing on a Rack

Before installing on a rack, be sure that the environment is within the recommended range:

Operating temperature range	+5 to +45 Deg. Centigrade
Operating humidity range	5 to 65% RHL, non-condensing
Storage temperature range	-20 to +70 Deg. Centigrade
Storage humidity range	5 to 95% RHL, non-condensing

⚠ **CAUTION!!**

When installing on a 19" rack, avoid hazards by taking care that:

1   It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.

2   Once rack mounted, enough air will still flow around the machine.

3   The machine is placed straight in the correct horizontal position.

4   You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.

5   The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to supply connections other than direct connections to the branch circuit (for example, the use of power strips), and that you use only the power cord that is supplied with the machine.

How to Rack Mount

To rack-mount a machine:

1   Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (5 on each side), and replace those screws through the ear brackets.
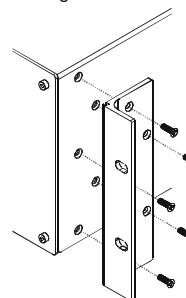
2   Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note that:

- **In some models, the front panel may feature built-in rack ears**
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions (you can download it at: http://www.kramerelectronics.com)

6   Connecting the VS-88HC

This section describes how to connect the **VS-88HC**. In particular, how to:

- Connect the **VS-88HC** rear panel (see section 6.1)
- Connect the audio signals (see section 6.2)
- Set the dipswitches (see section 6.3)

6.1 Connecting the VS-88HC Rear Panel

To connect the **VS-88HC**, as the example in Figure 4 illustrates, do the following[1]:

1. Connect up to eight component video sources[2] (for example, eight DVD players) to the three INPUT RCA connectors Y, U/Cb/Pb and V/Cr/Pr (from INPUT 1 to INPUT 8) and connect the corresponding digital audio sources to the S/PDIF[3] RCA connectors[4] (see section 6.2).

2. Connect[5] the eight sets of three OUTPUT RCA connectors Y, U/Cb/Pb and V/Cr/Pr (from OUTPUT 1 to OUTPUT 8) to up to eight video acceptors (for example, eight plasma displays), and connect the corresponding S/PDIF[6] RCA and/or ANALOG AUDIO OUTPUTS LEFT and RIGHT RCA connectors to the eight digital and/or analog audio acceptors[7] respectively (see section 6.2)

3. Set the dipswitches (see section 6.3).

4. If required, connect a PC and/or controller to the RS-232 port (see section 7.1) and/or the RS-485 port (see section 7.2) and/or the ETHERNET port (see section 7.3).

5. Connect the power cord[8] (not shown in Figure 4).

---

1 Switch OFF the power on each device before connecting it to your VS-88HC. After connecting your VS-88HC, switch on its power and then switch on the power on each device. DO NOT push in the rear panel Flash Program "FLASH PROG" button (see Table 3) and/or the ETH PROG switch. These are only used for upgrading to the latest Kramer firmware (see section 9)

2 Although in this example eight inputs are connected, you can connect less inputs

3 Or alternatively, a TOSLINK connector on channel 2 (IN)

4 Simultaneously, you can also connect analog audio sources to the ANALOG AUDIO INPUTS LEFT and RIGHT RCA connectors. The analog sources switch only to the analog outputs and the digital inputs switch only to the digital outputs (including the optical input and output)

5 When less than eight outputs are required, connect only those outputs of the VS-88HC that are required, and leave the other outputs unconnected

6 And/or a TOSLINK connector on channel 2 (OUT)

7 For example, an AV receiver or the audio connector of the plasma display

8 We recommend that you use only the power cord that is supplied with this machine

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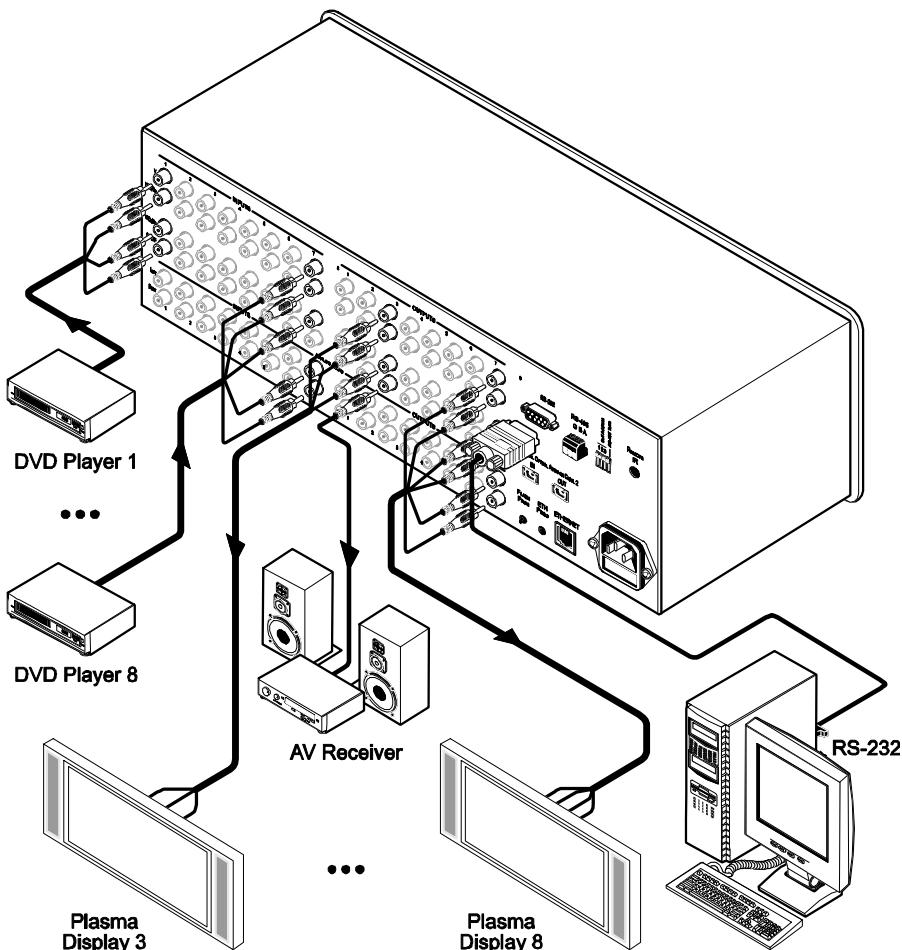
Figure 4: Connecting the VS-88HC 8x8 Home Entertainment Matrix Switcher

6.2 Connecting and switching the Audio Signals

The digital audio inputs and outputs (including the optical input and output) and the analog audio inputs and outputs switch separately. There is no conversion between the analog and the digital formats.

In other words, you can only switch a digital audio input to the digital audio outputs, and similarly, you can only switch an analog audio input to the analog audio outputs (but when switching audio signals[1], the analog and digital signals switch simultaneously). For example, when switching INPUT 1 to OUTPUT 7, the analog INPUT 1 is switched to the analog OUTPUT 7 and simultaneously, the digital INPUT 1 is switched to the digital OUTPUT 7.

The **VS-88HC** *8x8 Home Entertainment Matrix Switcher* inputs and outputs audio signals in the following formats:

- Eight ANALOG AUDIO LEFT and RIGHT inputs that can be outputted to eight ANALOG AUDIO LEFT and RIGHT outputs on RCA connectors (from INPUT 1 to INPUT 8 and from OUTPUT 1 to OUTPUT 8, respectively)

- Eight S/PDIF inputs that can be outputted to eight S/PDIF outputs on RCA connectors (from INPUT 1 to INPUT 8, and from OUTPUT 1 to OUTPUT 8, respectively)

- One TOSLINK input and one TOSLINK output for INPUT 2 and OUTPUT 2 (digital audio only)

---

1 In the AFV and AUDIO modes (see section 8.2)

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6.2.1   Digital Audio Input Output Switching

In the example illustrated in Figure 5, the S/PDIF INPUT 1 source is switched to the S/PDIF OUTPUT 2[1], the S/PDIF INPUT 7 is switched to OUTPUT 8, and INPUT 8 is not connected.
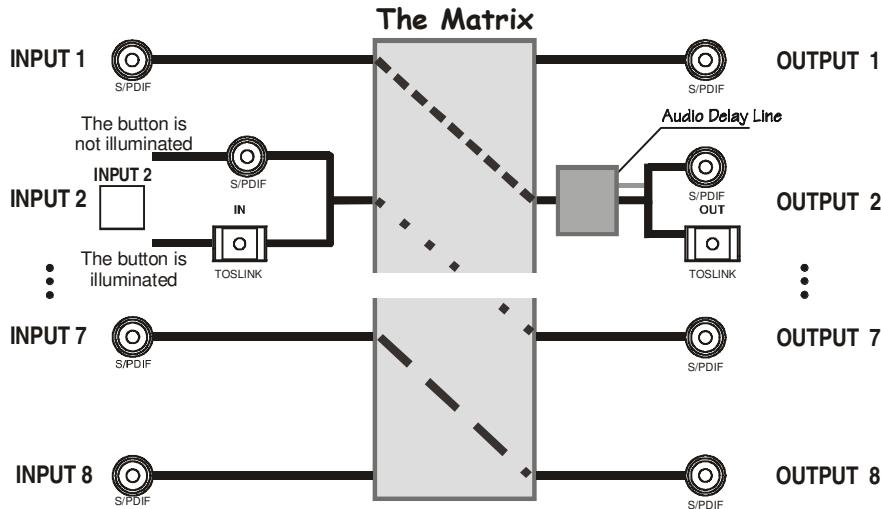
Figure 5: Connecting the VS-88HC Digital Audio Signals

The INPUT 2 digital audio signal (switched to OUTPUT 7) can be routed either via the INPUT 2 S/PDIF connector or the IN OPTICAL AUDIO connector, depending on the setup of the INPUT 2 button. To select the:

- S/PDIF connector, press the button gently and make sure it does not illuminate
- TOSlink connector, press the INPUT 2 button for over 2 seconds; the button illuminates and the signal is routed via the TOSlink connector

---

1 The digital audio signal on channel 2 is outputted simultaneously to the S/PDIF and the TOSLINK OUTPUT 2 connectors

6.3 Setting the Dipswitches

Figure 6 and Table 5 define the factory default dipswitches:

Figure 6: Dipswitch Settings

Table 5: Dipswitch Settings

DIPS	Function	Description
1, 2, 3	Self Address	Set the MACHINE # (see section 6.3.1)
4	RS-485 Term	ON for RS-485 Line Termination with 120Ω OFF for no RS-485 Line Termination

6.3.1 Setting the Self Address

To control a unit via RS-232 or RS-485, each unit has to be identified via its unique Self Address #. Set the Self Address #[1] on a **VS-88HC** unit via dipswitches 1, 2 and 3, according to Table 6.

Table 6: Self Address # Dipswitch Settings

Self Address #	DIPSWITCH		
	1	**2**	**3**
1	OFF	OFF	OFF
2	OFF	OFF	ON
3	OFF	ON	OFF
4	OFF	ON	ON
5	ON	OFF	OFF
6	ON	OFF	ON
7	ON	ON	OFF
8	ON	ON	ON

When connecting more than one **VS-88HC** unit, set a different self address # on each unit. You do not have to number the units in the sequence order in which they connect to the PC, but it is essential that each unit is assigned a unique machine number.

---

1 When using a single unit, set the unit to Self Address # 1

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7   Controlling the VS-88HC

You can control the **VS-88HC** via:

- RS-232 (see section 7.1)
- RS-485 (see section 7.2)
- The Ethernet (see section 7.3)
- The IR remote control transmitter[1]

7.1 Controlling via RS-232 (for example, using a PC)

To connect a PC[2] to the **VS-88HC** unit, using the Null-modem adapter provided with the machine (recommended):

- Connect the RS-232 DB9 rear panel port on the Master **VS-88HC** unit to the Null-modem adapter and connect the Null-modem adapter with a 9-wire flat cable to the RS-232 DB9 port on your PC

To connect a PC to the **VS-88HC** unit, without using a Null-modem adapter:

- Connect the RS-232 DB9 port on your PC to the RS-232 DB9 rear panel port on the Master **VS-88HC** unit, as Figure 7 illustrates
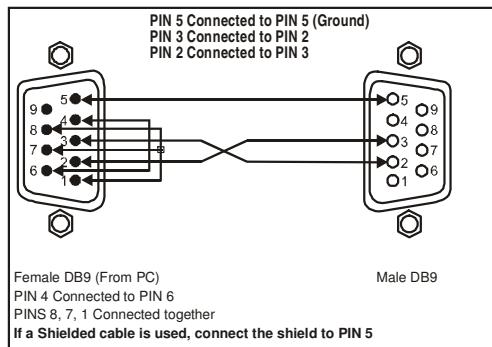
Figure 7: Connecting a PC without using a Null-modem Adapter

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1 Refer to the separate user manual. Download it from our Web site at http://www.kramerelectronics.com

2 Or a master program remote control system such as the Kramer RC-3000

7.2 Controlling via RS-485

You can control up to eight **VS-88HC** units via an RS-485 controller, for example, a PC (equipped with an RS-485 interface) or a Master Programmable Remote Control system such as the Kramer **RC-3000**.

To connect an **RC-3000** to a **VS-88HC** unit (see Figure 8), connect the RS-485 terminal block port on the **RC-3000** to the RS-485 port on the **VS-88HC** unit, as follows:

1. Connect the "A" (+) PIN on the RS-485 rear panel port of the **RC-3000** to the "A" (+) PIN on the RS-485 rear panel port of the **VS-88HC** unit

2. Connect the "B" (-) PIN on the RS-485 rear panel port of the **RC-3000** to the "B" (-) PIN on the RS-485 rear panel port of the **VS-88HC** unit

3. If shielded twisted pair cable is used, the shield may be connected to the "G" (Ground) PIN on one of the units (for example, on the **RC-3000**)

To cascade up to eight individual **VS-88HC** units, via RS-485, as illustrated in Figure 8, do the following:

1. Connect the component video sources and acceptors, as well as the appropriate digital audio sources and acceptors, as section 6.1 describes.

2. Connect the RS-485 terminal block port on the first **VS-88HC** unit to the RS-485 port on the second **VS-88HC** unit and so on, connecting all the RS-485 ports.

7.2.1   Set the Dipswitches

Set the dipswitches, as section 6.3 describes:

•   Assign a unique self address #[1] (from 1 to 8) for each **VS-88HC** unit, according to Table 6

•   Set DIP 4 ON on the **VS-88HC** unit located at the end of the line (terminating the RS-485 line at 120Ω).
    Set DIP 4 OFF on the other **VS-88HC** units

---

1 In any order

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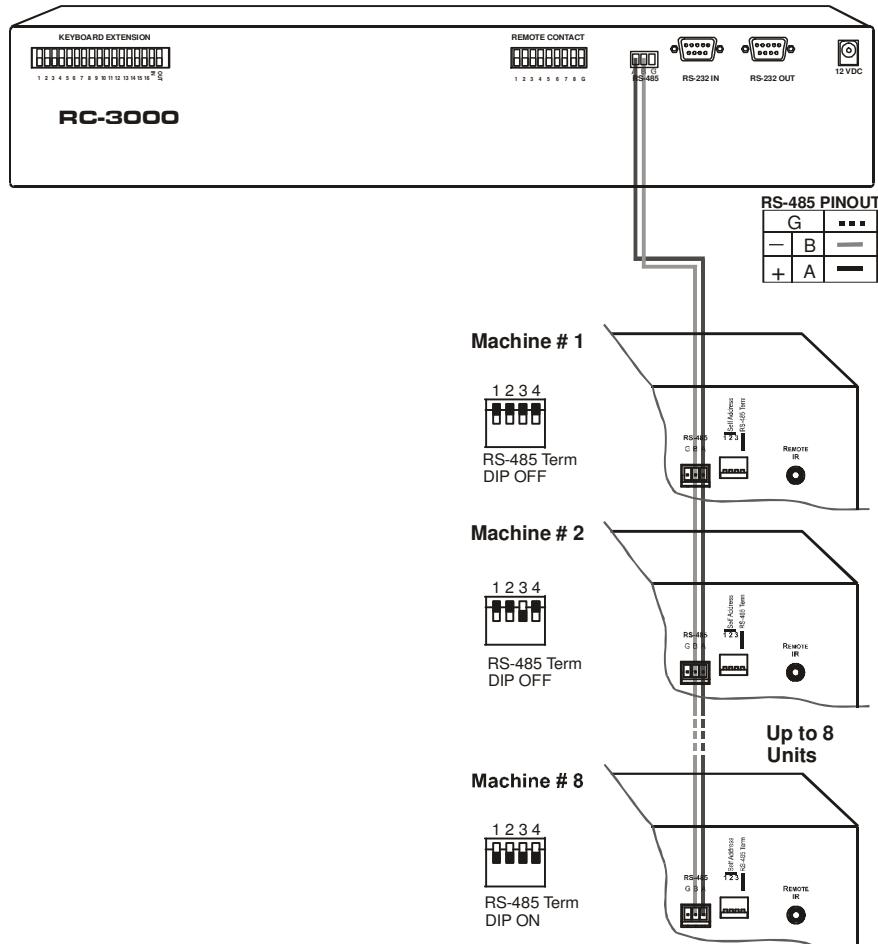
Figure 8: Cascading Individual Units in a Control Configuration via RS-485

7.3 Controlling the VS-88HC via the ETHERNET Port

You can connect the **VS-88HC** via the Ethernet, using a crossover cable (see section 7.3.1) for direct connection to the PC or a straight through cable (see section 7.3.2) for connection via a network hub or network router.

7.3.1 Connecting the ETHERNET Port directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-88HC** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP Address of the **VS-88HC** during the initial configuration

---

After connecting the Ethernet port, configure your PC as follows:

1. Right-click the My Network Places icon on your desktop.

2. Select **Properties**.

3. Right-click Local Area Connection Properties.

4. Select **Properties**.
   The Local Area Connection Properties window appears.

5. Select the Internet Protocol (TCP/IP) and click the **Properties** Button (see Figure 9).
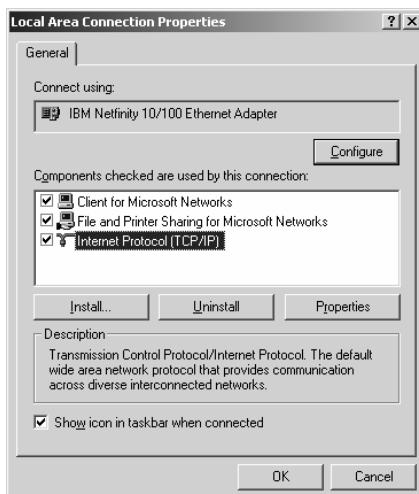
Figure 9: Local Area Connection Properties Window

6. Select Use the following IP address, and fill in the details as shown in Figure 10.

7. Click **OK**.
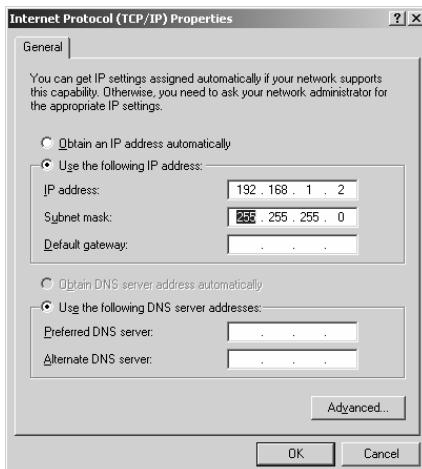
Figure 10: Internet Protocol (TCP/IP) Properties Window

7.3.2   Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the **VS-88HC** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

7.3.3   Configuring the Ethernet Port

After connecting the Ethernet port, you have to install and configure it. For detailed instructions on how to install and configure your Ethernet port, see the "Ethernet Configuration (FC-11) guide.pdf" on our Web site: http://www.kramerelectronics.com

8   Operating the VS-88HC

You can operate your **VS-88HC** via:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- Infra-red remote control transmitter
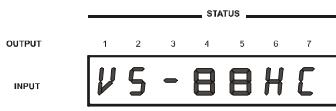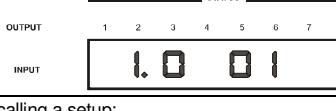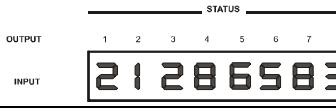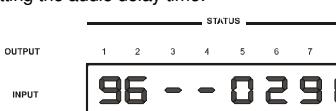
This section describes:

- The 7-segment display
- How to use the front panel buttons
- How to set and adjust the audio delay time

8.1 Displaying Unit Characteristics

Table 7 defines the information shown on the **VS-88HC** 7-segment display:

Table 7: 7-segment Display Information

Displayed Information	When:
• The video and audio inputs switched to the outputs (for example, input 2 is switched to output 1 and output 3)	During normal operation: STATUS OUTPUT 1 2 3 4 5 6 7 8 INPUT **2 1 2 8 6 5 8 3**
• The machine name immediately followed by the firmware version number (1.0 01)	Immediately after switching on the power; and when simultaneously pressing the three INPUT buttons 1, 2 and 3, for 3 seconds: STATUS OUTPUT 1 2 3 4 5 6 7 8 INPUT **V S - 8 8 H C** STATUS OUTPUT 1 2 3 4 5 6 7 8 INPUT **1. 0 0 1**
• The audio and video setup to be recalled after momentarily showing the setup # (blinking)	When recalling a setup: STATUS OUTPUT 1 2 3 4 5 6 7 8 INPUT **2 1 2 8 6 5 8 3**
• The digital audio sampling rate in kHz (for example, 96) and the delay time[1] in milliseconds (for example, 296)	When setting the audio delay time: STATUS OUTPUT 1 2 3 4 5 6 7 8 INPUT **9 6 - - 0 2 9 6**

---

1 To set the delay time, see section 8.6

8.2 Choosing the Audio-Follow-Video or Breakaway Option

You can switch the digital audio (S/PDIF) signals and the analog audio signals in one of two ways, either:

- Audio-follow-video (AFV), in which all operations and status indicators relate to both the video and the audio channels[1]; or
- Breakaway, in which video and audio channels switch independently

8.2.1 Setting the Audio-Follow-Video Option

To set the audio-follow-video (AFV) option:

1. Press the AFV button.
   The AFV button illuminates. The audio will follow the video[2].

2. Press the TAKE button to confirm the modification (reconfiguring the audio according to the video).

8.2.2 Setting the Breakaway Option

To set the breakaway option, press either the AUDIO (for audio control only) or the VIDEO (for video control only) button:

- If the AUDIO button illuminates, all switching operations relate to the audio section.
- If the VIDEO button illuminates, all switching operations relate to the video section

8.3 Switching OUT-IN Combinations

To switch a video/audio input to a video/audio output, do the following:

1. Press an OUTPUT button (from 1 to 8 or ALL).
   The corresponding 7-segment display blinks.

2. Press an INPUT button (from 1 to 8 or OFF).
   The selected input switches to the selected output.

For example, press the ALL button and then the INPUT button # 3 to connect input # 3 to all the outputs.

---

1 Audio and video connections are the same

2 If the audio input-output status does not correspond to the video input-output status, the 7-segment display shows the audio status, the audio button illuminates and the take button blinks. The machine enters the Confirm mode

8.4 Confirming Settings

You can choose to work in the At Once or the Confirm mode.

In the At Once mode (TAKE button is not illuminated):

- Pressing an OUT-IN combination implements the switch immediately
- You save time as execution is immediate and actions require no user confirmation
- No protection is offered to correct an erroneous action

In the Confirm mode (TAKE button is lit):

- You can key-in an action and then confirm it by pressing the TAKE button
- Every action requires user confirmation, protecting against erroneous switching
- Execution is delayed until the user confirms the action[1] by pressing the TAKE button

8.4.1 Toggling between the At Once and Confirm Modes

To toggle from the At Once to the Confirm mode, do the following:

1. Press the TAKE button to toggle between the At Once mode (in which the TAKE button is not lit) and the Confirm mode (in which the TAKE button illuminates).
   Actions now require user confirmation and the TAKE button illuminates.

2. Press the illuminated TAKE button to toggle from the Confirm mode back to the At Once mode.
   Actions no longer require user confirmation and the TAKE button no longer illuminates.

8.4.2 Confirming a Switching Action

To confirm a switching action (in the Confirm mode), do the following:

1. Press an OUT-IN combination.
   The corresponding 7-segment display blinks. The TAKE button also blinks.

2. Press the blinking TAKE button to confirm the action.
   The corresponding 7-segment display no longer blinks. The TAKE button illuminates.

---

1 Failure to press the TAKE button within one minute (the Timeout) will abort the action

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8.5 Storing/Recalling Input/Output Configurations

You can store and recall[1] up to 16 input/output configurations using the eight OUTPUT buttons and the eight INPUT buttons, as Figure 11 illustrates:
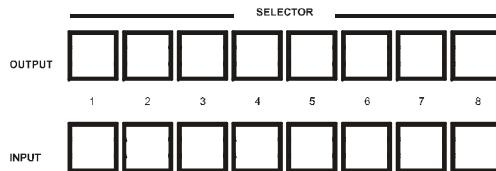
Figure 11: Storing and Recalling using the Input / Output Buttons

8.5.1   Storing an Input/Output Configuration

To store the current status in memory, do the following:

1. Press the STO/+ button.
   The STO/+ button blinks.

2. Press one of the 16 INPUT/OUTPUT buttons. Press the blinking TAKE button to confirm the action.
   The memory stores the data at that reference.

8.5.2   Recalling an Input/Output Configuration

To recall an input/output configuration, do the following:

1. Press the RCL/- button.
   The RCL/- button blinks.

2. Press the appropriate INPUT / OUTPUT button (the button # corresponding to the setup #). That setup configuration will blink in the Audio and Video 7-segment display and the TAKE button, and will only be implemented after pressing the TAKE button.
   The memory recalls the stored data from that reference.

> **Tip**: If you cannot remember which of the 16 input/output-configurations is the one that you want, set the **VS-88HC** to the Confirm mode and manually scan all the input/output configurations until you locate it.

---

1 The 16 input/output configurations (or setups) also include the relevant audio-follow-video / breakaway option definition

8.6 Setting and Adjusting the Audio Delay Time

You can adjust the S/PDIF audio delay time for OUTPUT 2 to correct lip sync errors so that the audio delay will match the video delay. The delay time can be set and stored separately for each input channel.

To set or adjust the audio delay, do the following:

1. Press the DELAY button on the front panel.
   The DELAY button blinks; the 7-segment display shows the sampling rate (in kHz) and the delay time in milliseconds.

2. Press the STO/+ and RCL/- buttons to increase or decrease the delay time[1] respectively.

3. Once the delay time is set, press the DELAY button again to accept the delay time value.
   The DELAY button illuminates and the 7-segment display goes back to displaying the inputs switched to the outputs.

The maximal delay time is set according to the input sampling rate[2], as described in Table 8:

Table 8: Maximum Delay Time according to Sampling Rate

Sampling Rate [kHz]	Maximum Delay Time [msec]
32	999
44	740
48	680
96	340

To cancel the delay time, press the DELAY button once again.
The DELAY button light turns off.

To reset the delay time to 0 (zero), press and hold the DELAY button for a few seconds.

Table 9 summarizes the way the DELAY button responds:

Table 9: DELAY Button Response

When the DELAY button:	Then:
Blinks	You can view the sampling rate and the delay time value, or adjust the delay time
Illuminates	OUTPUT 2 audio delay is on
Is not illuminated	OUTPUT 2 audio delay is off
Is pressed for a few seconds	Delay time resets to 0 (zero)

---

1 Press and hold the STO/+ or RCL/- buttons for a faster increase or decrease of the audio delay time respectively

2 The sampling rate is specified by the source signal and cannot be changed by the switcher. The switcher automatically adjusts the maximum delay time value according to the sampling rate

8.7 Locking the Front Panel

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock[1] your **VS-88HC**. Unlocking releases the protection mechanism.

To lock the **VS-88HC**:

- Press the LOCK button
  The LOCK button blinks. After pressing the LOCK button a second time, the front panel is locked. Pressing any other buttons will have no effect

To unlock the **VS-88HC**:

- Press the illuminated LOCK button
  The LOCK button blinks
  When pressing it a second time, the LOCK button no longer illuminates and the front panel unlocks

---

1 Nevertheless, even though the front panel is locked you can still operate via Ethernet, RS-232 and RS-485, as well as via the Kramer IR Remote Control Transmitter

9   Flash Memory Upgrade

The **VS-88HC** lets you upgrade both microcontrollers:

- The Switcher Microcontroller (see section 9.1)
- The Ethernet Microcontroller (see section 9.2)

9.1 Switcher Flash Memory Upgrade

The **VS-88HC** firmware is located in FLASH memory, which lets you upgrade[1] to the latest Kramer firmware version in minutes! The process involves:

- Downloading from the Internet (see section 9.1.1)
- Connecting the PC to the RS-232 port (see section 9.1.2)
- Upgrading Firmware (see section 9.1.3)

9.1.1   Downloading from the Internet

You can download the up-to-date file[2] from the Internet. To do so:

1. Go to our Web site at www.kramerelectronics.com and download the file: "*FLIP_VS88HC.zip*" from the Technical Support section.

2. Extract the file: "*FLIP_VS88HC.zip*" to a folder (for example, C:\Program Files\Kramer Flash).

3. Create a shortcut on your desktop to the file: "*FLIP.EXE*".

9.1.2   Connecting the PC to the RS-232 Port

Before installing the latest Kramer firmware version on a **VS-88HC** unit, do the following:

1. Connect the RS-232 DB9 rear panel port according to section 7.1.

2. Push the rear panel FLASH PROG button[3] to **Program** using a small screwdriver.

3. Switch the unit ON.

Note: this sequence is critical – first push the FLASH PROG button and then turn on the unit

---

1 Upgrade should be carried out by skilled technical personnel. Failure to upgrade correctly will result in the malfunction of the machine

2 The files indicated in this section are given as an example only. File names are liable to change from time to time

3 Item 19 in Table 3

---

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9.1.3   Upgrading Firmware

Follow these steps to upgrade the firmware:

1. Double click the desktop icon: "*Shortcut to FLIP.EXE*".
    The Splash screen appears as follows:

Figure 12: Splash Screen

2. After a few seconds, the Splash screen is replaced by the "*Atmel – Flip*"
    window:
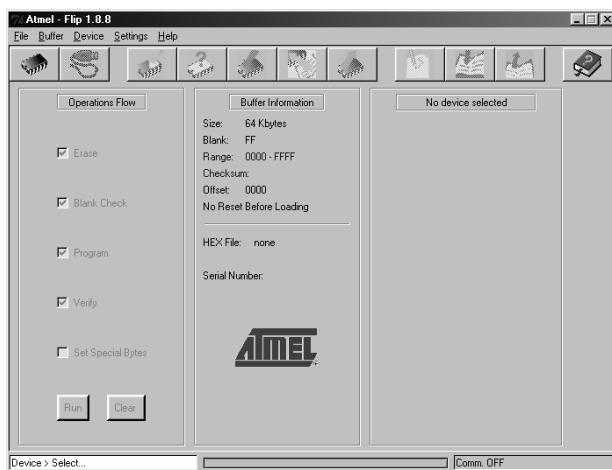
Figure 13: Atmel – Flip Window

3. Press the keyboard shortcut key *F2* (or select the "*Select*" command from the
    Device menu, or press the integrated circuit icon in the upper right corner of
    the window).
    The "*Device Selection*" window appears:

Figure 14: Device Selection Window

4. Click the button next to the name of the device and select from the list:
   AT89C51RD2:
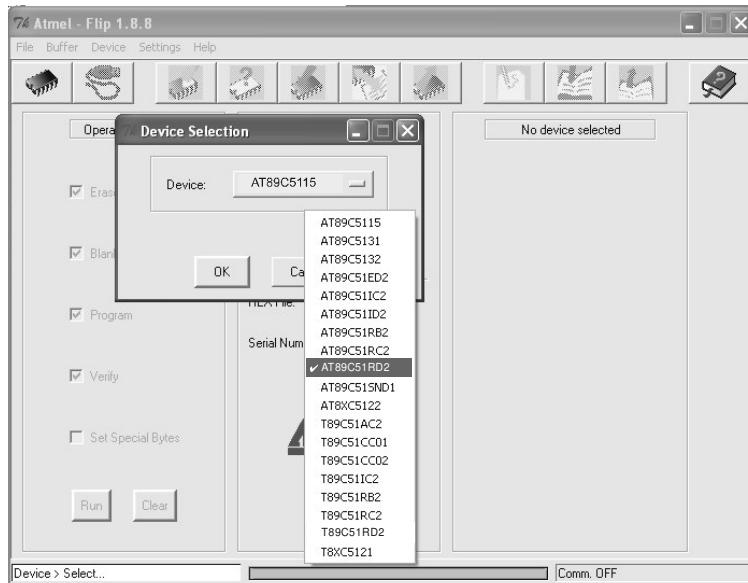
Figure 15: Device Selection Window

5. Click OK and select "*Load Hex*" from the *File* menu.
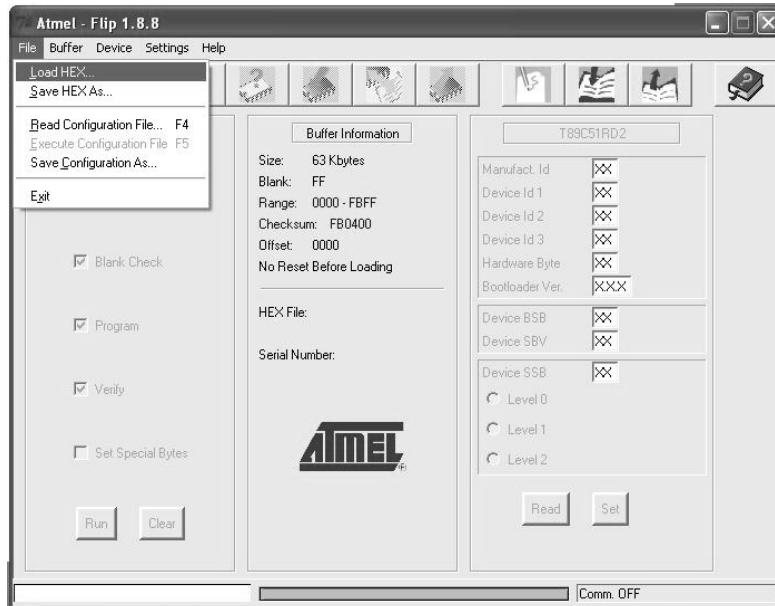
Figure 16: Loading the Hex

6. The Open File window opens. Select the correct HEX file that contains the updated version of the firmware for **VS-88HC** (for example *88M_V1p2.hex*) and click Open.

7. Press the keyboard shortcut key *F3* (or select the "*Communication / RS232*" command from the *Settings* menu, or press the keys: *Alt SCR*).
   The "*RS232*" window appears. Change the COM port according to the configuration of your computer and select the 9600 baud rate:
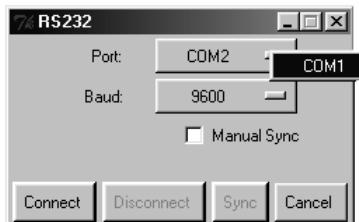
Figure 17: RS-232 Window

8. Click Connect.
   In the "*Atmel – Flip*" window, in the *Operations Flow* column, the *Run* button is active, and the name of the chip appears as the name of the third column: *AT89C51RD2*.

Verify that in the *Buffer Information* column, the "*HEX File: VS88HC.hex*" appears.
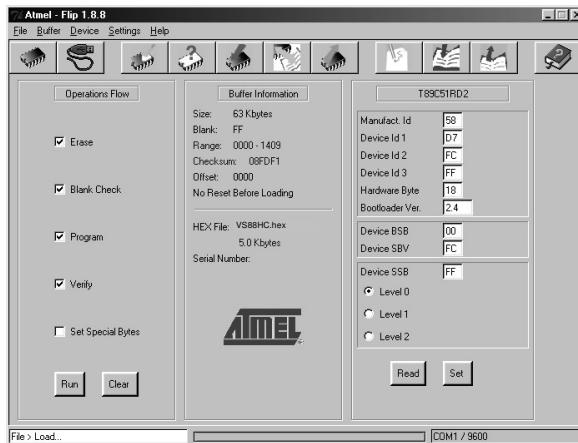
Figure 18: Atmel – Flip Window (Connected)

9. Click *Run*.
   After each stage of the operation is completed, the check-box for that stage becomes colored green[1].
   When the operation is completed, all 4 check-boxes will be colored green and the status bar message: *Memory Verify Pass* appears[2]:
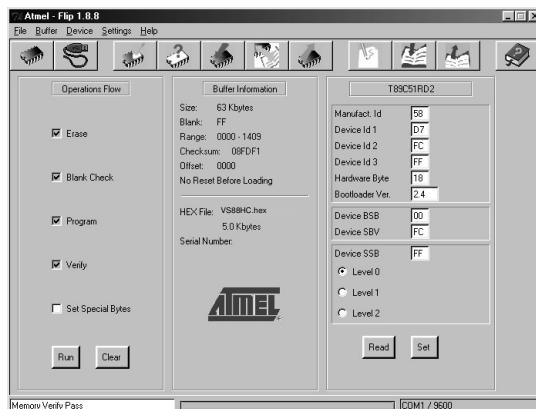
Figure 19: Atmel – Flip Window (Operation Completed)

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1 See also the blue progress indicator on the status bar

2 If an error message: "Not Finished" shows, click Run again

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10. Close the "*Atmel – Flip*" window.

11. Disconnect the power on the **VS-88HC**.

12. If required, disconnect the *RS-232* rear panel port on the **VS-88HC** unit from the Null-modem adapter.

13. Release the FLASH PROG button on the rear panel (Table 3).

14. Connect the power to the **VS-88HC**.
    Upon initialization, the new **VS-88HC** software version shows in the STATUS 7-segment Display.

9.2 Ethernet Flash Memory Upgrade

The **VS-88HC** firmware is located in FLASH memory, which lets you upgrade[1] to the latest Kramer firmware version in minutes!

The process involves:

- Downloading the upgrade package from the Internet
- Connecting the PC to the RS-232 port
- Upgrading the firmware

9.2.1 Downloading from the Internet

You can download the up-to-date file[2] from the Internet. To do so:

1. Go to our Web site at http://www.Kramerelectronics.com and download the file: "*SetKFRETH11-xx.zip*" from the technical support section.

2. Extract the file "*SetKFRETH11-xx.zip*" package, which includes the KFR-Programmer application setup and the *.s19* firmware file, to a folder (for example, C:\Program Files\KFR Upgrade).

3. Install the KFR-Programmer Application.

---

1 Upgrade should be carried out by skilled technical personnel. Failure to upgrade correctly will result in the malfunction of the machine

2 File names are liable to change from time to time

9.2.2   Connecting the PC to the RS-232 Port

Before installing the latest Kramer Ethernet firmware version on the
VS-88HC, do the following:

1. Connect the RS-232 DB9 port (COM 1) on the **VS-88HC** to a Null-modem
   adapter and connect the Null-modem adapter with a 9-wire flat cable to the
   RS-232 DB9 COM port on your PC.

2. Push in the ETH PROG button, located on the machine rear side.

3. Connect the power on your machine.

9.2.3   Upgrading Firmware

Follow these steps to upgrade the firmware:

1. Double click the KFR-Programmer desktop icon.
   The KFR-Programmer window appears (see Figure 20).
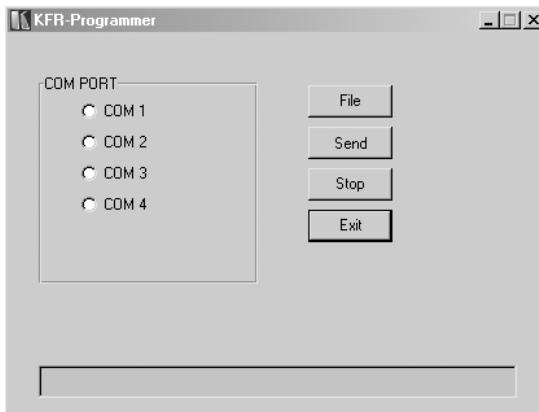
Figure 20: The KFR-Programmer Window

2. Select the required COM Port[1].

3. Press the File button to select the *.s19* firmware file included in the package.

4. Press the Send button to download the file. The Send button lights red.

5. Wait until downloading is completed and the red Send button turns off.

6. Disconnect the power on the **VS-88HC**.

7. Release the ETH PROG button, located on the machine rear panel.

8. Connect the power on your machine.

---

1 To which the VS-88HC is connected on your PC

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10 Technical Specifications

Table 10 includes the technical specifications:

Table 10: Technical Specifications[1] of the VS-88HC

Video Components	
INPUTS:	8 sets of component video (Y, Pb/Cb, Pr/Cr) 1Vpp, 0.7Vpp, 0.7Vpp / 75Ω on RCA connectors
OUTPUTS:	8 sets of component video (Y, Pb/Cb, Pr/Cr) 1Vpp, 0.7Vpp, 0.7Vpp / 75Ω on RCA connectors
MAX. OUTPUT LEVEL:	2.8Vpp
RESOLUTION:	Up to 1080p, fully loaded
DIFF. GAIN:	0.11%
DIFF. PHASE:	0.82 Deg
K-FACTOR:	<0.05%
S/N RATIO:	75.5dB @5MHz
CROSSTALK (all hostile):	-49.5dB @5MHz
COUPLING:	DC
Audio Components	
INPUTS:	8 S/PDIF digital audio, on RCA connectors; 1 TOSLINK optical 8 audio stereo, 5Vpp/150Ω on RCA connectors
OUTPUTS:	8 S/PDIF digital audio, on RCA connectors; 1 TOSLINK optical 8 audio stereo, 5Vpp/150Ω on RCA connectors
MAX. OUTPUT LEVEL:	21Vpp
BANDWIDTH:	>100kHz
S/N RATIO:	83dB
CROSSTALK (all hostile):	-79dB @20MHz
COUPLING:	Input: AC; output: AC
AUDIO THD + NOISE:	0.055% @1kHz
AUDIO 2nd HARMONIC:	0.008% @1kHz
S/PDIF SAMPLE RATE:	Up to 192kHz
RESOLUTION:	Up to 24 bits
JITTER:	<1.5ns (50Hz to 100kHz) without delay, <3.5ns (50Hz to 100kHz) with delay
MAXIMUM DELAY TIME FOR CHANNEL 2:	32kHz – 999ms; 44.1kHz – 740ms; 48kHz – 680ms; 96kHz – 340ms
DELAY RESOLUTION:	1ms
General	
CONTROLS:	Analog audio level: -50dB to 48dB; front panel buttons, Ethernet, RS-232, RS-485, IR remote control, dipswitch address selector
POWER SOURCE:	100-264 VAC, 50/60 Hz; 14mA
DIMENSIONS:	19-inch (W), 7-inch (D) 3U (H) rack-mountable
WEIGHT:	4.9kg (10.8lbs.) approx.
ACCESSORIES:	Power cord, Null modem adapter, Windows®-based Kramer control software, Windows®-based Ethernet Configuration Manager and Virtual Serial Port Manager, Infra-red remote control transmitter
OPTIONS	External IR receiver unit[2]

---

1 Specifications are subject to change without notice

2 Kramer P/N: 95-0103050

11 Table of Hex Codes for Serial Communication

Sections 11.1 and 11.2 contain the tables of hex codes for switching and setting the delay time, respectively.

11.1 Hex Codes for Switching

Table 11 lists the video Hex values for a single machine (Self Address # 1):

Table 11: Hex Codes for Switching Video Channels via RS-232/RS-485

	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8
IN 1	01	01	01	01	01	01	01	01
	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	01	01	01
	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	01	01	01
	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	01	01	01
	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	01	01	01
	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 6	01	01	01	01	01	01	01	01
	86	86	86	86	86	86	86	86
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 7	01	01	01	01	01	01	01	01
	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 8	01	01	01	01	01	01	01	01
	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81

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Table 12 lists the audio Hex values for a single machine (Self Address # 1):

Table 12: Hex Codes for Switching Audio Channels via RS-232/RS-485

	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8
IN 1	02	02	02	02	02	02	02	02
	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 2	02	02	02	02	02	02	02	02
	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 3	02	02	02	02	02	02	02	02
	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 4	02	02	02	02	02	02	02	02
	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 5	02	02	02	02	02	02	02	02
	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 6	02	02	02	02	02	02	02	02
	86	86	86	86	86	86	86	86
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 7	02	02	02	02	02	02	02	02
	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 8	02	02	02	02	02	02	02	02
	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81

11.2   Hex Codes for Setting the Audio Delay Time

To set the audio delay time, use command 22 (set audio parameter) in the following way:

- Byte 1 should be 22 (16H)
- Byte 2 should be 128 (80H) plus input Channel number (from 1 to 8)
- Byte 3 should be 128 (80H) plus delay value in milliseconds (from 1 to 127)
- Byte 4 should be 128 (80H) plus machine number (from 1 to 15)

Table 13 describes several examples for the hex codes used to set the delay time:

Table 13: Hex Codes for Setting the Audio Delay Time

Delay Time [msec]	For	Command			
0	IN 1	I6	81	80	81
5	IN 2	I6	82	85	81
64	IN 3	I6	83	84	81
127	IN 4	I6	84	FF	81

For delay times exceeding 127ms, you need to send two commands (eight bytes).

The first command includes the most significant bits:

- Byte 1 should be 63 (7FH[1])
- Byte 2 should be 127 (80H) plus Most Significant bits of required delay
- Byte 3 should be 127 (80H)
- Byte 4 should be 127 (80H) plus machine number (from 1 up to 15)

The second command includes the less significant bits as described previously for command 22.

Table 14 describes hex code examples for setting increased audio delay times:

Table 14: Hex Codes for Increasing the Audio Delay Time

Delay Time for IN 1 [msec]	Command			
128	7F	80	81	81
	I6	81	80	81
130	7F	80	81	81
	I6	81	82	81
200	7F	80	81	81
	I6	81	C8	81
680	7F	80	85	81
	I6	81	A8	81

To increase, for example, the IN 1 audio delay time by 1msec, the hex code would be:

I8	82	8C	81

To decrease, for example, the IN 4 audio delay time by 1msec, the hex code would be:

I8	84	8D	81

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1 According to instruction 63 in the protocol (see section 12)

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12 Kramer Protocol 2000[1]

The **VS-88HC** is compatible with Kramer's Protocol 2000 (version 0.48)
(below). This RS-232/RS-485 communication protocol uses four bytes of
information as defined below. For RS-232, a null-modem connection between
the machine and controller is used. The default data rate is 9600 baud, with
no parity, 8 data bits and 1 stop bit.

Table 15: Protocol Definitions

MSB							LSB

	DESTI-NATION	INSTRUCTION					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

1st byte

	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0

2nd byte

	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0

3rd byte

			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

4th byte

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION":   0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (ie. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
O6…O0 – "OUTPUT".
When switching (ie. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their <u>machine numbers.</u> When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

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1 You can download our user-friendly "Software for Calculating Hex Codes for Protocol 2000" from our Web site:

http://www.kramerelectronics.com

Table 16: Instruction Codes for Protocol 2000

Note: All values in the table are decimal, unless otherwise stated.

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET VIDEO	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2, 15
2	SWITCH AUDIO	Set equal to audio input which is to be switched (0 = disconnect)	Set equal to audio output which is to be switched (0 = to all the outputs)	2
3	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3, 15
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
6	REQUEST STATUS OF AN AUDIO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
7	VIS SOURCE	Set as input # when OUTPUT byte = 6; OR set as output # when OUTPUT byte = 7; OR set as blank period (in steps of 25ms) when OUTPUT byte = 32; OR set = 0. *****	0 - No VIS (immediate) 1 - Input # 1 2 - External digital sync 3 - External analog sync 4 - Dynamic sync 5 - Inter-machine sync 6 - Input # (INPUT byte) 7 - Output #(INPUT byte) 8 - User-defined sync 32 - RGBHV seamless switching 64 - Set for delayed switch 65 - Execute delayed switch 66 - Cancel delayed switch setting	2, 5, 17, 18
8	BREAKAWAY SETTING	0	0 - audio-follow-video 1 - audio breakaway	2
		1	0 - FOLLOW mode 1 - Normal mode	15
9	VIDEO / AUDIO TYPE SETTING	0 - for video	0 - CV 4 - SDI 1 - YC 5 - CV+YC 2 - YUV 6 - VGA scaler 3 - RGBS 7 - DVI	2
		1 - for audio	O0=0 – Unbalanced audio O0=1 – Balanced audio O1=0 – Digital audio O1=1 – Analog audio O4=0, O3=0, O2=0-Mono O4=0, O3=0,O2=1-Stereo	
		2 - for VGA and DVI	1 - 640X480 2 - 800X600 3 - 1024X768	
10	REQUEST VIS SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - VIS source 1 - Input # or output # of source 2 - Vertical sync freq (Hz)	3, 4, 6, 7
11	REQUEST BREAKAWAY SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - Request audio breakaway setting 1 - Request "FOLLOW" setting	3, 4, 6, 15
12	REQUEST VIDEO / AUDIO TYPE SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - for video 1 - for audio 2 - for VGA	3, 4, 6
13	SET HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	Set equal to highest machine address	2
14	REQUEST HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	0	4
15	REQUEST WHETHER SETUP IS DEFINED / VALID INPUT IS DETECTED	SETUP # or Input #	0 - for checking if setup is defined 1 - for checking if input is valid	8

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
16	ERROR / BUSY	For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input	9, 25
17	RESERVED	-	-	10
18	RESET AUDIO	0	0	1
19	STORE AUDIO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3
20	RECALL AUDIO STATUS	Set as SETUP #	0	2, 3
21	SET VIDEO PARAMETER	Equal to input / output number whose video parameter is to be set (0 = all)	Set as parameter value	2, 11, 24
22	SET AUDIO PARAMETER	Equal to input / output number whose parameter is to be set (0 = all)	Set as parameter value	2, 11, 24
23	INCREASE / DECREASE VIDEO PARAMETER	Equal to input / output number whose video parameter is to be increased / decreased (0 = all)	0 - increase video gain 1 - decrease video gain 2 - increase contrast 3 - decrease contrast 4 - increase brightness 5 - decrease brightness 6 - increase colour 7 - decrease colour 8 - increase hue 9 - decrease hue 16 - increase H-phase 17 - decrease H-phase 18 - increase V-position 19 - decrease V-position	24
24	INCREASE / DECREASE AUDIO PARAMETER	Equal to input / output number whose parameter is to be increased / decreased (0 = all)	0 - increase output 1 - decrease output 2 - increase left output 3 - decrease left output 4 - increase right output 5 - decrease right output 6 - increase input 7 - decrease input 8 - increase left input 9 - decrease left input 10 -increase right input 11 - decrease right input	24
25	REQUEST AUDIO PARAMETER	Equal to input / output number whose parameter is requested	0	6, 24
26	REQUEST VIDEO PARAMETER	Equal to input / output number whose video parameter is requested	0	6, 24
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
32 to 35	RESERVED	-	-	10
40	DIRECT MEMORY SAVE	Memory address	Data	20
42	AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25	INPUT Bit: I0=input; 1=output I1 - Left I2 - Right	0 - Gain 1 - Bass 2 - Treble 3 - Midrange 4 - Mix On	24

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
43	VIDEO PARAMETER SETTINGS FOR INSTRUCTIONS 21, 23, 26	1 – Input 2 – Output	0 - video gain 1 - contrast 2 - brightness 3 - colour 4 - hue 5 - H-phase 6 - V-position	24
44	MEDIA CONTROL	Set equal to switch number	Switch data	
45	REQUEST MEDIA CONTROL SETTINGS	Set equal to switch number	0	
56	CHANGE TO ASCII	0	1 - SVS protocol 2 - Generic protocol	19
57	SET AUTO-SAVE	I3 - no save I4 - auto-save	0	12, 2
58	EXECUTE LOADED DATA	Set as 0, or as SETUP #.	1-Take 2-Cancel	22, 3
59	LOAD VIDEO DATA	Set equal to video input (0 = disconnect) (127 = load SETUP #)	Set equal to video output (0 = to all the outputs) or SETUP #	22, 23
60	LOAD AUDIO DATA	Set equal to audio input (0 = disconnect) (127 = load SETUP #)	Set equal to audio output (0 = to all the outputs) or SETUP #	22, 23
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version 5 - RS422 controller name 6 - RS422 controller version 7 - remote control name 8 - remote software version 9 - Protocol 2000 revision	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 3 - Request third suffix 10 - Request first prefix 11 - Request second prefix 12 - Request third prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio 3 - for SDI 4 - for remote panel 5 - for RS-422 controller	14
63	EXTENDED DATA	7 MSBs for INPUT data	7 MSBs for OUTPUT data	20

NOTES on the above table:

NOTE 1 - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

NOTE 2 - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code
01   85   88   83
was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes:
41   81   87   83
to the PC.
When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid, the switcher replies by sending to the PC the same four bytes that it was sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code
0B   80   80   85
would be HEX codes

4B	80	81	85

NOTE 5 – For the OUTPUT byte set as 6, the VIS source is the input selected using the OUTPUT byte. Similarly, for the OUTPUT byte set as 7, the VIS source is the output selected using the OUTPUT byte. Note also, that on some machines the sync source is not software selectable, but is selected using switches, jumpers, etc!

NOTE 6 – If INPUT is set to 127 for these instructions, then, if the function is defined on this machine, it replies with OUTPUT=1. If the function is not defined, then the machine replies with OUTPUT=0, or with an error (invalid instruction code).

If the INPUT is set to 126 for these instructions, then, if possible, the machine will return the current setting of this function, even for the case that the function is not defined. For example, for a video switcher which always switches during the VIS of input #1, (and its VIS setting cannot be programmed otherwise), the reply to the HEX code

0A	FE	80	81 (ie. request VIS setting, with INPUT set as 126dec)

would be HEX codes

4A	FE	81	81 (ie. VIS setting = 1, which is defined as VIS from input #1).

NOTE 7 – Setting OUTPUT to 0 will return the VIS source setting as defined in instruction #7. Setting to 1 will return the input # or output # of the sync source (for the case where the VIS source is set as 6 or as 7 in instruction #7). Setting to 2 returns the vertical sync frequency (0 for no input sync, 50 for PAL, 60 for NTSC, 127 for error).

NOTE 8 - The reply is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined / no valid input is detected; or 1 if it is defined / valid input is detected.

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed via the front panel. Reception of this code by the switcher is not valid.

NOTE 10 – This code is reserved for internal use.

NOTE 11 – For machines where the video and / or audio parameter is programmable.

NOTE 12 - Under normal conditions, the machine's present status is saved each time a change is made. The "power-down" save (auto-save) may be disabled using this code. Note that whenever the machine is turned on, the auto-save function is set.

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the audio machine name would be (HEX codes):

	7D	96	90	81 (i.e. 128dec+ 22dec for 2nd byte, and 128dec+ 16dec for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):

	7D	83	85	81 (i.e. 128dec+ 3dec for 2nd byte, 128dec+ 5dec for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):

	7D	D9	C3	81 (i.e. 128dec+ ASCII for "Y"; 128dec+ ASCII for "C").

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, not to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code

3E	82	81	82 (ie. request the number of outputs)

would be HEX codes

7E	82	90	82

ie. 16 outputs

NOTE 15 – When the OVR bit (4th byte) is set, then the "video" commands have universal meaning. For example, instruction 1 (SWITCH VIDEO) will cause all units (including audio, data, etc.) to switch. Similarly, if a machine is in "FOLLOW" mode, it will perform any "video" instruction.

NOTE 16 - The reply to the "REQUEST WHETHER PANEL IS LOCKED" is as in NOTE 4 above, except that here the OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

NOTE 17 – For clean switching of RGBHV video, the "seamless switching" option may be used. The blanking period for the transition of the RGB sources may be set in this case, in steps of 25 milliseconds.

For example, to set for 350ms blanking time (14 steps), send HEX codes

07	8E	A0	81

NOTE 18 – Delayed execution allows switching after a delay dictated by RS-232. To do this, the user sends instruction 7 with the "Set for delayed switch" option (64dec) before sending the switch command (instruction 1) or pressing via front panel. The switch is not executed (unless timed-out) until the "Execute delayed switch" code is sent, or the "Set for delayed switch" code is sent again. (The mode is automatically cancelled after implementation of the switch if the "execute" command is used).

For example, to connect input 4 to output 3 after a delay, send HEX codes

07	80	C0	81	(set for delayed switch)
01	84	83	81	(switch code)

then, after the required delay, send HEX codes

07	80	C1	81	(execute delayed switch)

to implement the switch.

NOTE 19 – After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 20 – When data (ie. the INPUT and/or OUTPUT bytes) of more than 7 bits is required, this instruction is sent before sending the instruction needing the additional bits. The data in this instruction then becomes the Most Significant Bits of that next instruction. For example, to set the audio gain (instruction 22) of output 3 to 681dec (2A9hex), you would first send HEX codes

3F	80	85	81

and then send HEX codes

16	83	A9	81.

To set the audio gain of output 6 to 10013dec (271Dhex), first send HEX codes

3F	80	CE	81

followed by HEX codes

16	86	9D	81.

NOTE 21 – To store data in the non-volatile memory of the unit, eg. the EEPROM for saving SETUPS. The EEPROM address is sent using the INPUT byte, and the data to be stored is sent using the OUTPUT byte. To use this instruction, it is necessary to understand the memory map, and memory structure of the particular machine.

NOTE 22 – Instruction 59 and instruction 60 load data for sending to the crosspoint switcher (or for storing in a SETUP), ie. the data is "lined-up" to be executed later. Instruction 58 executes the loaded data.

NOTE 23 – If the INPUT byte is set as 127dec, then the data stored in a SETUP is loaded. The SETUP # is in the OUTPUT byte.

NOTE 24 – Further information needed in instructions 21, 22, 25 and 26, is sent using instruction 42 – which is sent prior to the instruction. For example, to request the audio gain value of right input # 9, send hex codes

2A	84	80	81

and then send HEX codes

19	89	81	81.

To set MIX mode, send hex codes

2A	81	84	81

and then send HEX codes

16

NOTE 25 – For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time).

For example, if input 3 is detected as invalid, the unit will send the HEX codes

10	83	84	81

If input 7 is detected as valid, then the unit will send HEX codes

10	87	85	81.

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.

2. Any product, on which the serial number has been defaced, modified or removed.

3. Damage, deterioration or malfunction resulting from:
   i)   Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v)   Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.

2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.

3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.

2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).

3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

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EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:

2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

⊠ Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.

⊠ Use the supplied DC power supply to feed power to the machine.

⊠ Please use recommended interconnection cables to connect the machine to other components.

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distributors, visit our Web site: www.kramerelectronics.com,
where updates to this user manual may be found.
We welcome your questions, comments and feedback.**

Safety Warning:
Disconnect the unit from the power supply before
opening/servicing.

Caution

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